

CLAIMS

1. A metabolically engineered micro-organism having an operative first metabolic pathway in which a first
5 metabolite is transformed into a second metabolite in a reaction in which NAD is a cofactor for a first enzyme, said reaction step producing NADH, and in which said second metabolite is transformed into at least one further metabolite in a reaction catalysed by a second
10 enzyme, and having an operative second metabolic pathway characterised by an enzyme activity in excess of a native level in respect of a third enzyme catalysing a non-reversible reaction in which NADP is a cofactor and NADPH is a product and in which said first
15 metabolite is transformed into a said further metabolite without the involvement of said second enzyme.
2. A micro-organism as claimed in claim 1, wherein said
20 first metabolic pathway is a native pathway.
3. A micro-organism as claimed in any preceding claim, wherein said first enzyme is a phosphorylating dehydrogenase.
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4. A micro-organism as claimed in claim 1 or claim 2, wherein said second enzyme is a kinase.
5. A micro-organism as claimed in claim 3, wherein said
30 third enzyme is a non-phosphorylating dehydrogenase.

6. A micro-organism as claimed in claim 5, wherein said third enzyme is GAPN (EC 1.2.1.9).
7. A micro-organism as claimed in claim 6, wherein said first enzyme is GAPDH (EC 1.2.1.12).
8. A micro-organism as claimed in any preceding claim, wherein at least one copy of a genetic sequence encoding said third enzyme has been recombinantly introduced into said organism.
9. A micro-organism as claimed in any preceding claim, wherein a genetic sequence encoding said third enzyme is operatively linked to an expression signal not natively associated with said genetic sequence in said organism.
10. A micro-organism as claimed in any preceding claim which is a yeast.
11. A micro-organism as claimed in claim 10, which is a micro-organism belonging to the genus *Saccharomyces*, *Kluveromyces*, *Candida*, *Pichia*, *Debaromyces*, *Hansenula*, *Yarrowia*, *Zygosaccharomyces* or *Schizosaccharomyces*.
12. A micro-organism as claimed in claim 10, which is a strain of *Saccharomyces cerevisiae*, *S. kluyveri*, *S. bayanus*, *S. exiguus*, *S. sevazzi*, *S. uvarum*, *Kluveromyces lactis*, *K. marxianus* var. *marxianus*, *K. thermotolerans*, *Candida utilis*, *C. tropicalis*, *Pichia stipidis*, *P. pastoris*, *P. sorbitophila*, *Debaromyces hansenii*, *Hansenula polymorpha*, *Yarrowia lipolytica*,

Zygosaccharomyces rouxii or *Schizosaccharomyces pombe*..

13. A genetically transformed micro-organism containing one
or more copies of an heterologous DNA sequence encoding
5 GAPN operatively associated with an expression signal
and having a functional native or heterologous
expression capability for GAPDH (EC 1.2.12).
14. A method of producing a desired metabolic product with
10 decreased production of an undesired metabolic product,
comprising culturing a micro-organism as claimed in any
preceding claim.
15. A method as claimed in claim 14, wherein the desired
15 product is ethanol, lactic acid, citric acid, an amino
acid or an antibiotic.
16. A method as claimed in claim 14 or claim 15, wherein
20 said undesired metabolic product is glycerol, acetate
or an amino acid.